Energy Technologies Area Lawrence Berkeley National Laboratory

Demand-Side Energy Efficiency in EPA's Clean Power Plan

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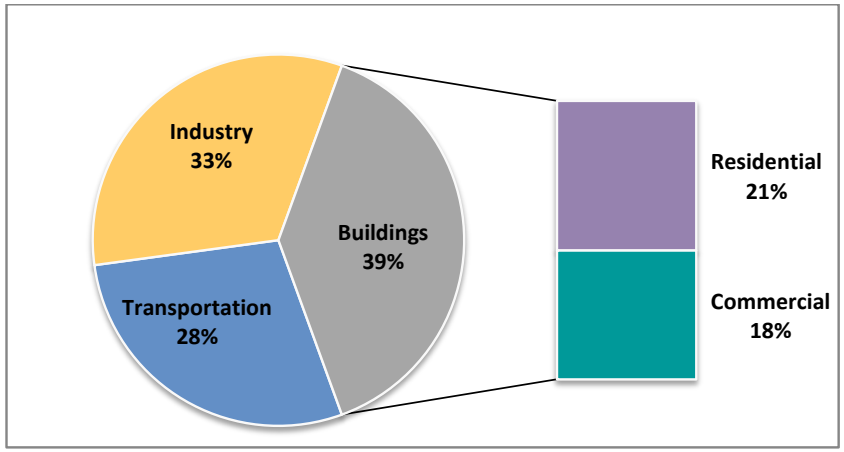
- Provides technical assistance to states – primarily state energy offices, air offices, and utility regulatory commissions
- Assistance is independent and unbiased

Context – industry and buildings represent about ¾ of U.S. energy consumption

And industry and buildings are where demand-side electricity efficiency happens

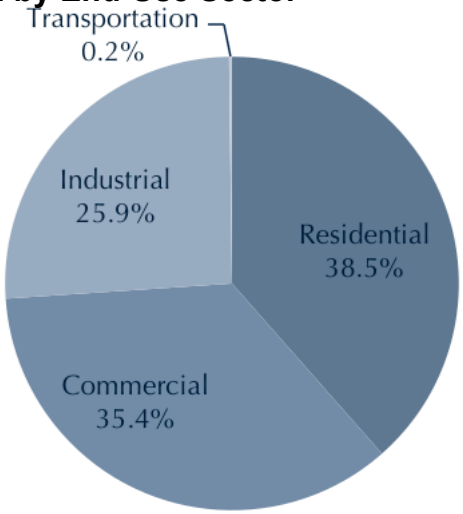
- Residential and commercial buildings account for about 70% of total U.S. electricity consumption and about 40% of U.S. carbon dioxide (CO_2) emissions.
- Nearly all of the greenhouse gas (GHG) emissions from the residential and commercial sectors can be attributed to energy use in buildings
- About 1/4 of electricity goes to industry where efficiency can be quite cost-effective

Buildings Share of U.S. Primary Energy Consumption



Source: U.S. Department of Energy (DOE), *2008 Buildings Energy Data Book*, Section 1.1.1, 2008.

Retail Sales of Electricity to Ultimate Customers, Total by End-Use Sector – source US EIA



Context: jobs

- There are on the order of ½ million to a million (and maybe more) efficiency jobs in the U.S.
  - There is not a consistent definition of EE jobs so hard to quantify
  - LBNL found about about 400,000 EE service jobs in 2010. On the other hand, ACEEE found about 850,000 EE jobs in 2012, AEE found about 300,000 EE jobs in CA alone
- Efficiency jobs are in every legislative district in the country
- Efficiency generates not just direct jobs, but indirect jobs and induced jobs in local economies
- There are more efficiency jobs than than wind and solar (combined)

Energy Efficiency Basics

Historical Context

Who wore this sweater on February 2, 1977?

Jimmy Carter (2 weeks after becoming President)

"One of our most urgent projects is to develop a national energy policy. Our program will emphasize conservation."

"All of us must learn to waste less energy."

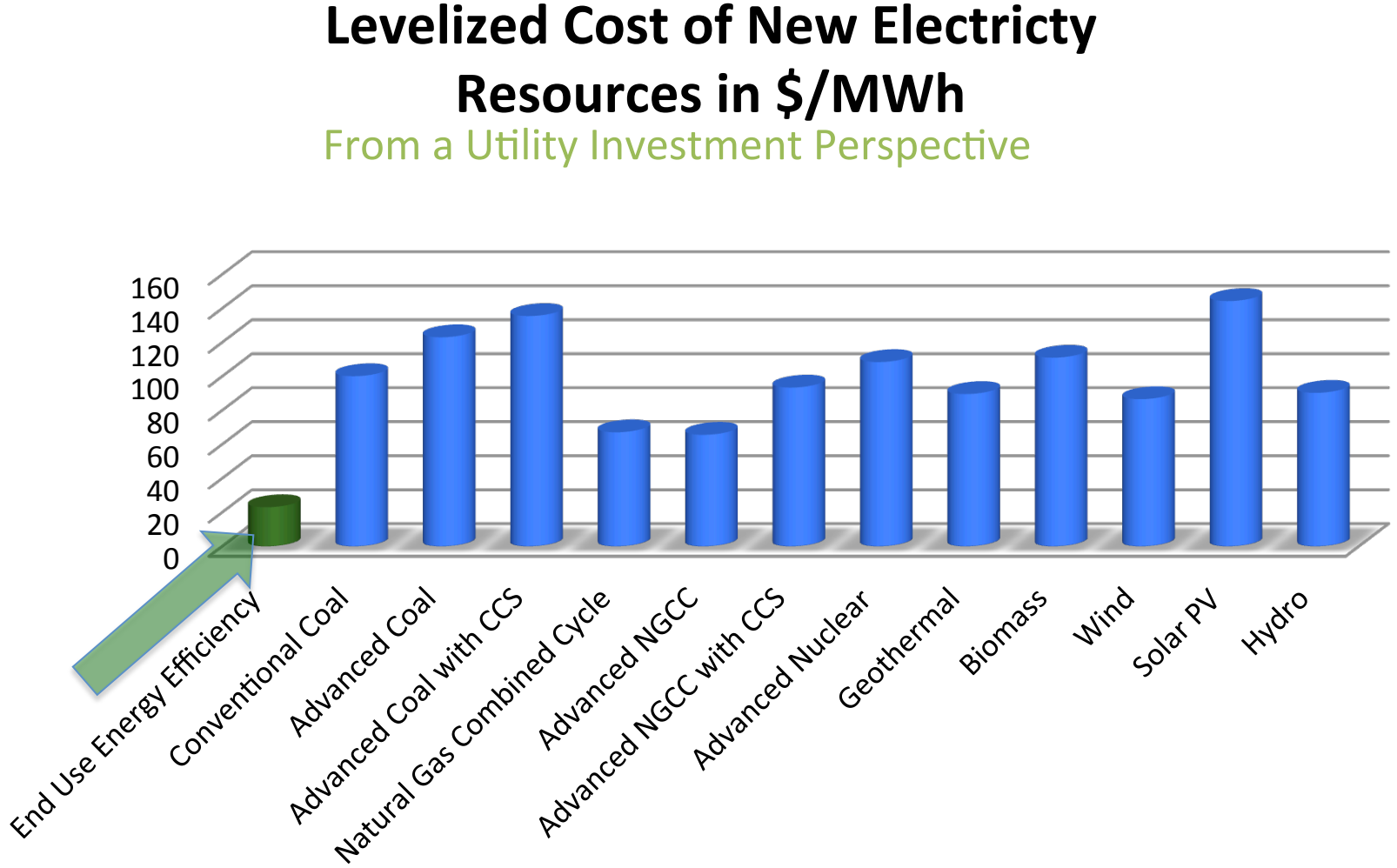
What is Efficiency

- **Energy Conservation**: Doing with less of a service in order to save energy:
  - *Using less energy and probably getting less output/service quality*
  - *Example: Turning up the thermostat to get less cooling*
- **Energy Efficiency**: The use of less energy to provide the same or an improved level of output or service to the energy consumer in an economically efficient way:
  - *Using less energy to perform the same function*
  - *Example: A more efficient air conditioner*
- Turning street lights off versus installing efficient street light lamps and controls

Why is Efficiency Important

- Cost savings
- Reliability improvement
- Environmental impact mitigation

Why Efficiency: Its Relatively Cheap



Why Efficiency: Increases Reliability

- Less demand = less generation, transmission and distribution required and less fuel
- Can be targeted, modular, and quickly implemented
- Capacity & electricity reliability benefits, and supports renewable integration

- Bottom line – if your boat sank, would you rather swim 1 mile or ½ mile to shore

Why Energy Efficiency: Multi-Pollutant Reductions

- Demand-side efficiency reduces emissions by avoiding the need to generate electricity in the first place
- Efficiency is included as a top measure to meet the reduction goals of state GHG mitigation plans
  - Of the approximately 30 state-level climate change action plans that have been completed since 2000, efficiency programs were in the "top 10" GHG reduction measures and in many cases were among the top five measures
- Of course *all* types of power plant-related emissions are reduced

Health and Welfare Impacts of Air Pollutants and Energy Efficiency Reduction Potential

Pollutant	Climate Forcer	Acidifying Substance	Eutrophying Substance	Ozone Precursor	Particulate Matter or Precursor	Can Be Reduced Through Energy Efficiency
Ammonia (NH_3)		X	X		X	X
Carbon Dioxide (CO_2)	X	X				X
Carbon Monoxide (CO)	X			X		X
Heavy Metals (HM)					X	X
Methane (CH_4)	X			X		X
Nitrogen Oxides (NO_x)	X	X	X	X	X	X
Non-Methane Volatile Organic Compounds (NMVOC)	X			X	X	X
Primary Particulate Matter (PM)	X				X	X
Polycyclic Aromatic Hydrocarbons (PAH)					X	X
Sulfur Dioxide (SO_2)	X	X			X	X

Table Source: SEE Action Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gas Emissions and Meet Energy Needs in the Power Sector (forthcoming)

Efficiency is an Established Resource

- Efficiency programs have been in place in the U.S. for several decades, and every state has programs in place
- Many utilities include demand-side efficiency in the resource plans they develop to guide investment decisions and operational plans
- Nevertheless, there is significant (and 'renewing') untapped efficiency potential

There are a lot of options for new construction and retrofit efficiency savings

Broad Categories of Efficiency Program
"Utility" programs
Codes and standards
Performance contracting
Distribution system improvements
Water conservation/ energy efficiency combination projects
Financing programs
Low income/at-risk/ disadvantaged community programs

Strategies

Funding	Lead Entity	Time Frame
▪ Utility customers ▪ Public/General funds ▪ Cap and Trade Auction Funds ▪ Consumers ▪ Industry	• Local and state agencies • Federal Entities • Utilities • Non-profits • Industry collaboratives	• Short Term – Quick Start • Medium term • Long Term
Market Segments/ Sectors	**Objectives**	**Implementation Strategies**

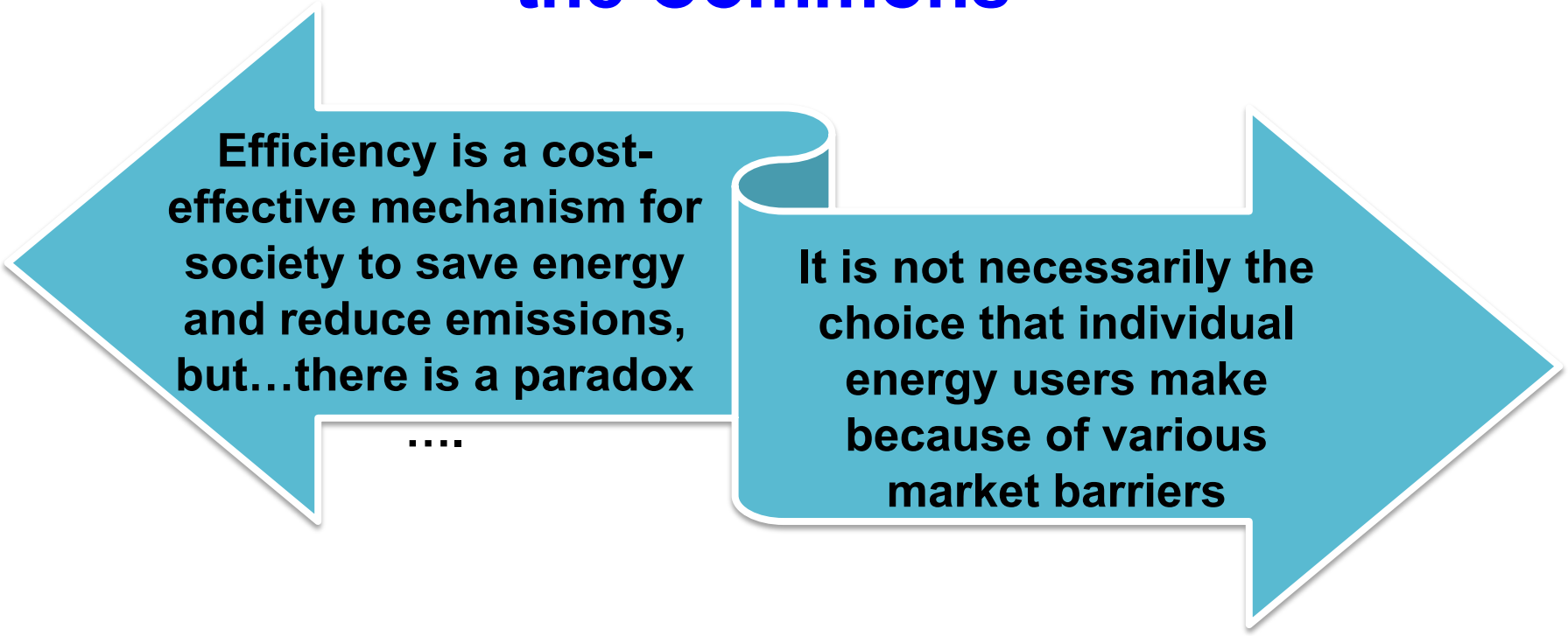
• Market Segments
  • Upstream
  • Mid-stream
  • Down stream
• Market Sectors
  • Commercial
  • Residential and Multi-Family
  • Low Income
  • Agricultural
	• Market transformation
	• Resource Acquisition
	• Pilots
	• Infrastructure development
		• Voluntary
		  • Direct Install
		  • Incentives
		  • Financing
		• Mandatory
		  • Codes
		  • Standards

So What Is The Problem?

Barriers to Energy Efficiency

Or – How many people does it take to screw in a LED?

Efficiency's Version of the Tragedy of the Commons



Barriers and Opportunities

Barriers

- Front-end investment requirements
- Principal agent problem (property owner/tenant)
- Lack of information
- Transaction costs
- Lack of knowledgeable contractors, suppliers, etc.
- Uncertainty in documenting benefits

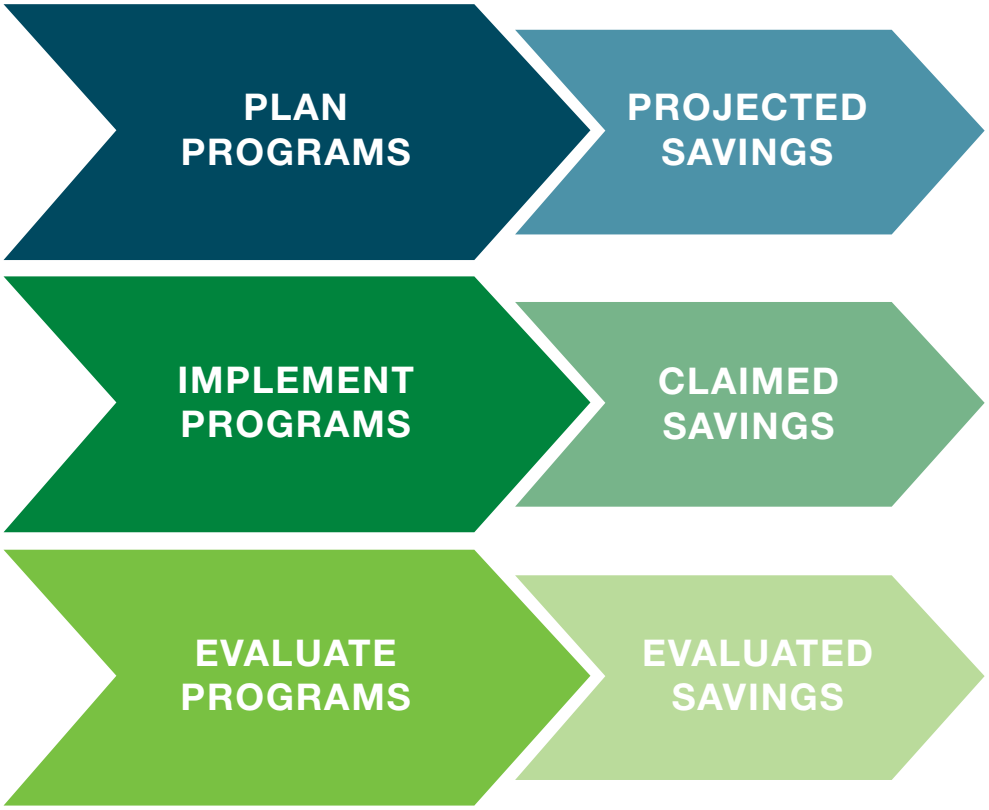
Opportunities

- Utility programs
- Codes and Standards
- Performance contracting
- Distribution efficiency
- Etc.
- Etc.

Some EM&V Basics

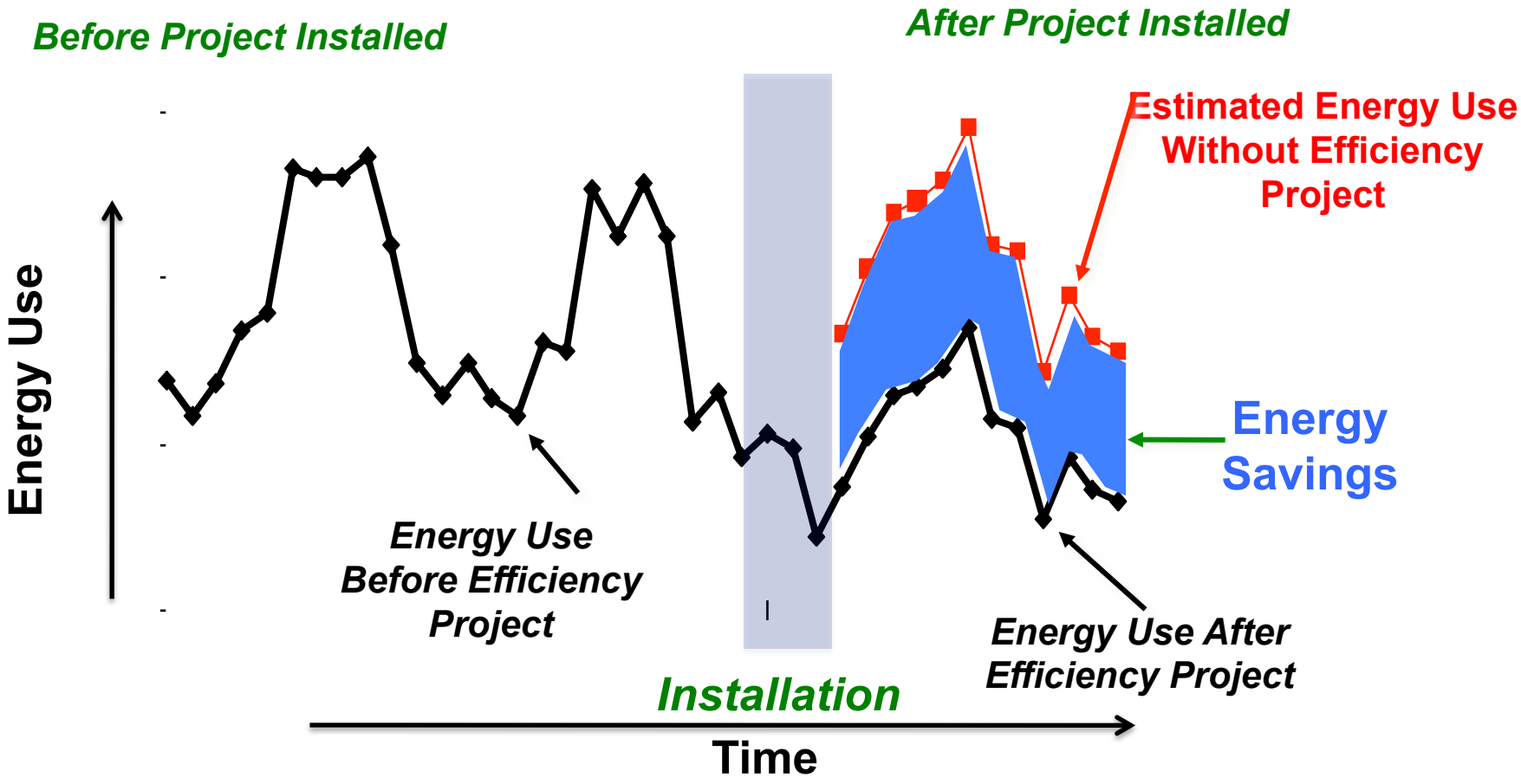
Planning, Implementing, and Evaluating Efficiency Programs

Evaluation, Measurement and Verification - The performance of studies and activities aimed at determining the effects of a portfolio, program or project – *things that are measured tend to improve*



Savings Cannot Be Measured -

they are *estimated* against a baseline



Graph of Energy Consumption Before, During And After Project Is Installed

Demand-Side Energy Efficiency in the Clean Power Plan

State Plan Types and Overall Approaches

- States pick a **mass-** or **rate-based goal approach**
- States submit a "State Plan" for affected EGUs to implement interim and final goals (or federal plan is implemented)
- Federal enforcement is on the EGUs
- Two State Plan types:
  - **Emission standards plan** – EGU source-specific requirements ensuring all affected EGUs meet their goals
  - **State measures plan**– mixture of measures implemented by the state, such as renewable energy standards and efficiency programs

Plan Type	Goal
Emissions Standard Plan	Rate or mass-based goal
State Measures Plan	Mass-based goal only

Many CO_2 Reduction Opportunities

- Heat rate improvements
- Fuel switching to a lower carbon content fuel
- Combined heat and power
- Qualified biomass co-firing and repowering
- Renewable energy (new & capacity uprates) - wind, solar, hydro
- Nuclear generation (new & capacity uprates)
- Electricity transmission and distribution improvements
- Carbon capture and utilization/sequestration for existing sources
- ***Demand-side energy efficiency measures, programs and policies***

Energy efficiency improvements are expected to be an important part of state compliance across the country and under all state plan types, providing energy savings that reduce emissions, lower electric bills, and lead to positive investments and job creation

Energy Efficiency Strongly Supported in CPP

CPP encourages states to select efficiency as a compliance path:

- Under a mass-based approach, energy efficiency automatically "counts" toward compliance and states can use an unlimited amount to help achieve their state goals
- Under a rate-based approach, CPP enables states to get credit for all eligible energy efficiency projects whose electricity savings are documented via EM&V
- The Clean Energy Incentive Program (CEIP) provides additional incentives for early investment in demand-side energy efficiency in low-income communities

Eligible Efficiency

- Demand-side energy efficiency may include a range of eligible measures that are zero-emitting and avoid, rather than simply shift, the use of electricity. Very wide range of programs, projects and measures could be eligible.
- Primary requirement is that the measures can be quantified and verified in accordance with the EM&V requirements in the CPP Emission Guidelines.
- Savings from projects installed today (since 2012) that are still achieving quantifiable and verifiable energy savings in 2022 may be applied during the compliance period.

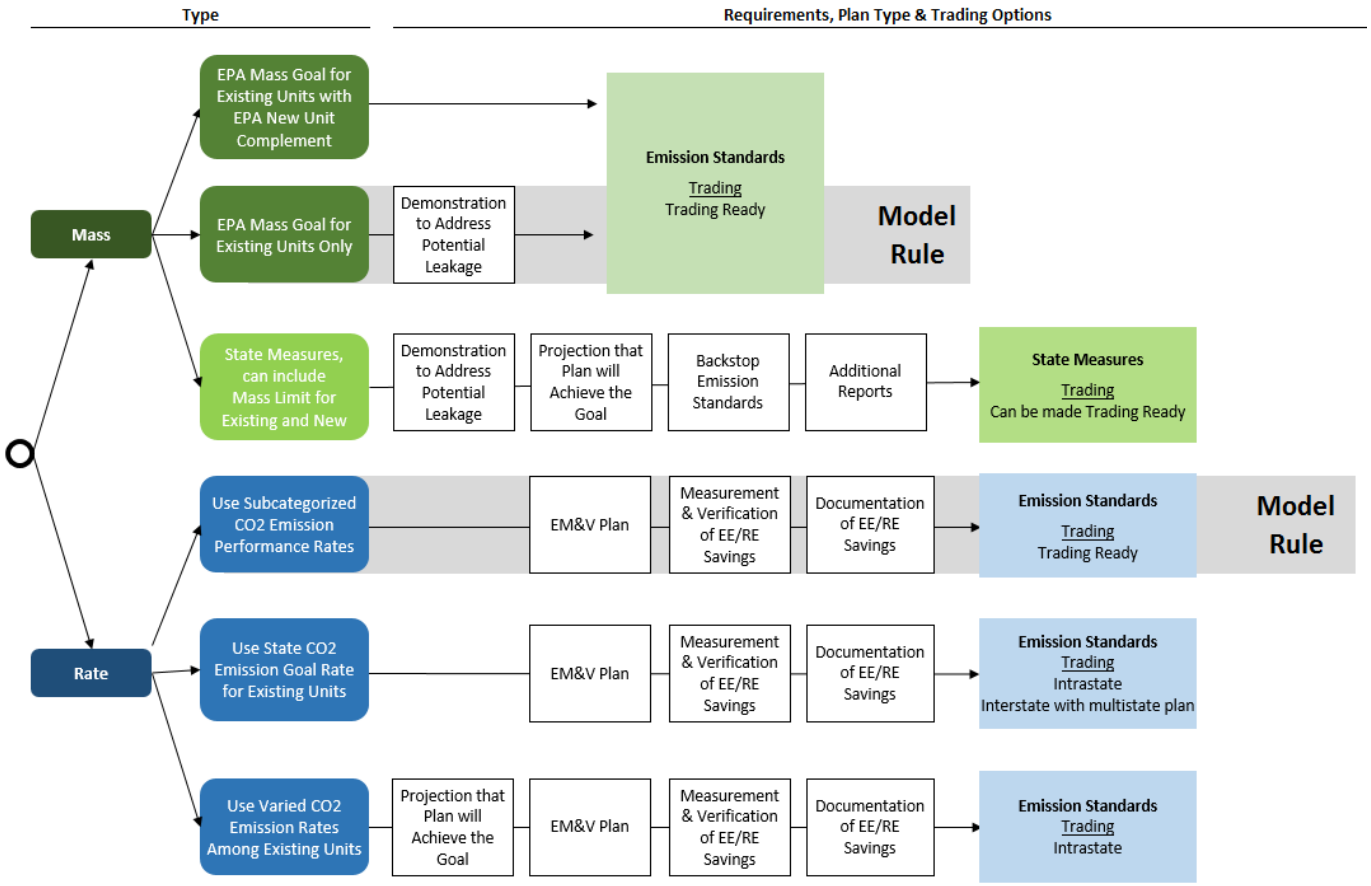
Early Investments

- EPA is providing the Clean Energy Incentive Program (CEIP) to incentivize early investments that generate wind and solar power or reduce end-use energy demand during 2020 and 2021
- The CEIP is an optional, "matching fund" program states may choose to use to incentivize early investments in wind or solar power, as well as demand-side energy efficiency measures that are implemented in low-income communities
- EPA will provide matching allowances or Emission Rate Credits (ERCs) to states that participate in the CEIP, up to an amount equal to the equivalent of 300 million short tons of CO2 emissions

Overview of Plan Options

- This chart shows some of the compliance pathways available to states under the final Clean Power Plan. Ultimately, it is up to the states to choose how they will meet the requirements of the rule.
- EPA's illustrative analysis shows that nationwide, in 2030, a **mass-based approach is less-expensive** than a rate-based approach ($5.1 billion versus $8.4 billion).
- Under a mass-based plan, states that anticipate continuing or expanding investments in energy efficiency have unlimited flexibility to leverage those investments to meet their CPP targets. EE programs and projects do not need to be approved as part of a mass-based state plan, and EM&V will not be required.
- For states currently implementing mass-based trading programs, the "state measures" approach offers a ready path forward.
- Demand-side energy efficiency is an important, proven strategy that states are already widely using and that can substantially and cost-effectively lower CO_2 emissions from the power sector.

Updated Aug. 5, 2015 5 pm



How EE/RE Fits in the Clean Power Plan

- slide from U.S. EPA

State Plan Approach		Role of EE/RE in State Plan	State Strategies for EE/RE	EM&V Needed?	Considerations
Emission Standards	Mass	*EE reduces cost, EE/RE lowers CO_2 emissions but are not enforceable or written into the state plan*	• Allocate CO_2 allowances for EE/RE (e.g. through a set aside)	*	* EM&V generally not required for CPP purposes, except for CEIP and set asides specifically created to meet the leakage requirement • Unlimited flexibility with EE/RE implementation
			• Auction allowances, use $ for EE/RE		
			• Secure matching allowances for solar, wind and low-income EE from Clean Energy Incentive Program (CEIP)	✓	
	Rate	*Explicitly written into state plan; Used to generate ERCs and directly adjust reported CO_2 emissions rate of affected EGUs*	• Include EE/RE ERC tracking, trading, and issuance provisions in the state plan	✓	• EM&V plans and M&V reports required • EE/RE is explicitly tracked & credited • Trading-ready plans facilitate broad access to ERCs • EE/RE implemented after 2012 can generate credits starting in 2022
			• Issue ERCs for quantified and verified MWh savings from eligible EE/RE measures	✓	
			• Secure matching ERCs from CEIP for solar, wind, low-income EE	✓	
State Measures	State Demonstration Based on Mass	*Explicitly included as supporting material for state plan – enforceable under state law; State EE/RE policies and measures can be used to help affected EGUs meet mass goal*	• Implement state EE/RE policies and programs (e.g., EERS, RPS, building codes) that are enforceable under state law, either to meet goal or in conjunction with federally enforceable limits	✓*	• Projection of EE/RE impacts required and EGU CO_2 performance required ✓* EM&V Plan for EE/RE measures must be included as supporting material for state plan • Backstop emission standards for affected EGUs if CO_2 reductions don't materialize
			• Secure matching allowances from CEIP for solar, wind and low-income EE	✓	

CPP EE EM&V In One Slide

Do I need to do EM&V for CPP?

- Mass –
  - EGU Emission Standards Plan – Not really
  - State Measures Plan – Yes, but not fundamental to compliance calculations
- Rate –
  - EGU Emission Standards Plan - Yes, fundamental to compliance calculations
- CEIP –
  - Mass or rate plans - Yes

EM&V "musts"

- Prepare an EM&V plan that provides for quantified and verified savings by applying industry best-practice protocols and guidelines
- Provide regular interval EM&V and periodic reports
- Use a baseline that represents what would have happened in the absence of the demand-side EE activity – common practice baseline
- Address savings persistence
- Have independent verification
- No double counting

For the CPP, EM&V is primarily associated with successfully quantifying and verifying savings for generating emission rate credits (ERCs) and adjusting an emission rate

Efficiency EM&V Coverage in the CPP

CPP Document	Type of EM&V Information	Notes
CPP Emissions Guidelines – see Section VIII.K	Requirements	Must do for CPP compliance to quantify and verify savings
Proposed Model Trading rule - see Section IV.D.8.	Presumptively approvable EM&V approaches	Strongly recommended characteristics of EM&V for approvable State Plans. Any alternative EM&V approaches implemented by a state must be "equivalent" to the presumptively approvable provisions
Proposed EM&V Guidance for Demand Side EE	Applicable guidance	Further information and recommendations covered in this companion document

Energy Efficiency in the CPP – Rate-Based Approach

- **EE can be used to generate Emission Rate Credits (ERCs) that are used to help meet the rate target**
- **Rate based approaches are where there are significant CPP EM&V and tracking requirements for EE**

CPP Emissions Rate =

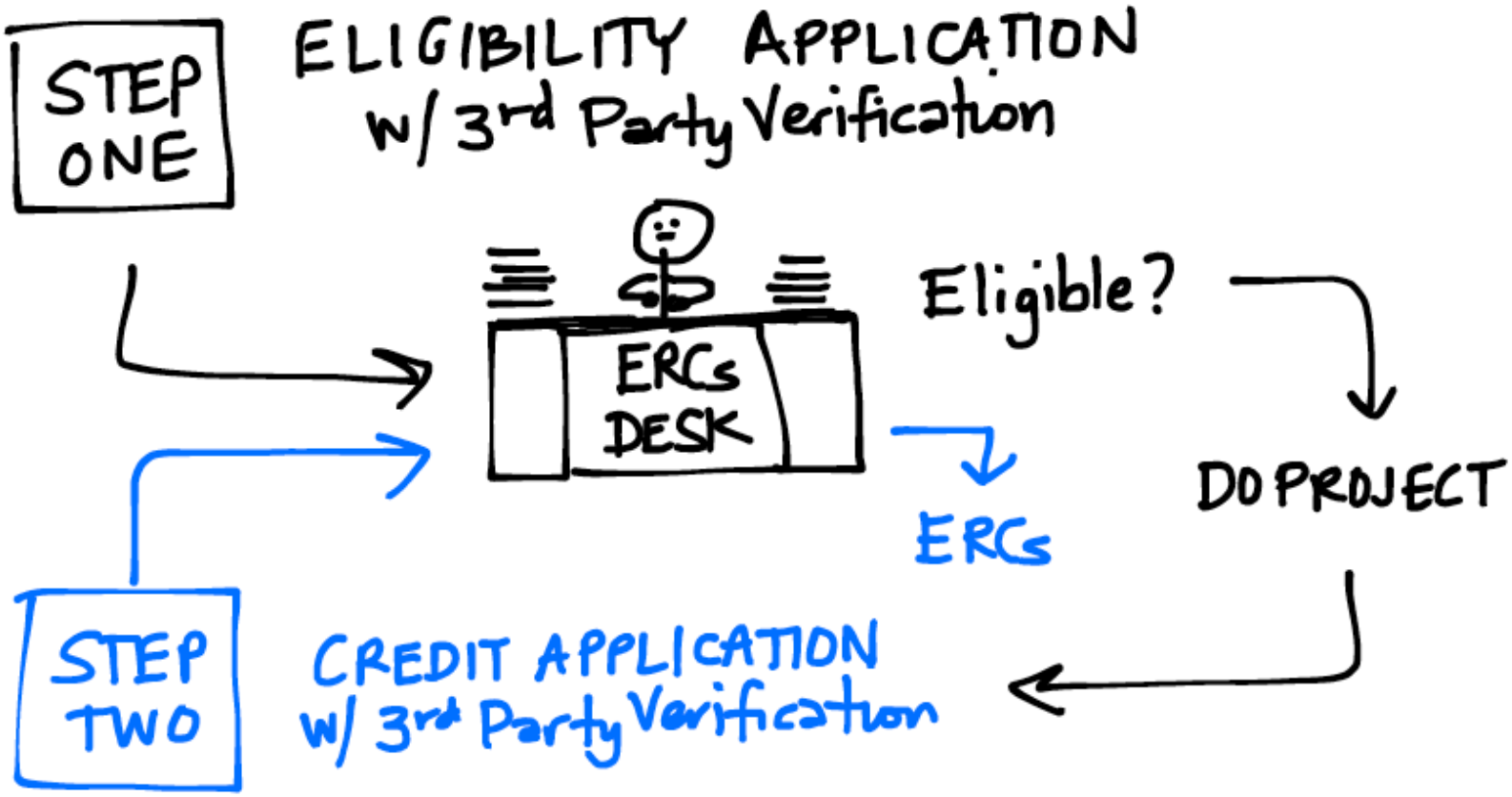
$$\frac{\text{(Affected EGU Emissions, lbs/year)}}{\text{(Affected EGU Generation, MWh/year)} + \text{(ERCs, MWh/year)}}$$

Example:

- Emission = 1,000,000 lbs/year
- Generation = 1,000 MWh/year
- Emission rate = 1,000 lbs/MWh
- Target = 800 lbs/MWh
- ERCs required = 250 MWh/yr ➡ CPP Rate = 800 lbs/MWh

Metric is Annual MWh

The ERC Process – slide from Franz Litz, Program Consultant, Great Plains Institute



! Liability for improperly issued ERCs lies with the affected EGU who uses them for compliance !

Energy Efficiency in the CPP – Mass-Based Approach

EE reduces emissions mass "indirectly":

- **Complimentary programs – e.g., energy codes, EERS, public buildings programs**
- **Could be funded with allowance auction funds**

- Emission Standards plan – EE does not have to be defined and thus EM&V does not have to be defined in plans (probably)
- State measures plan – EE measures do need to be defined and thus EM&V Plan is required
- EE EM&V is less of an issue with mass-based approach, because it is not fundamental to compliance calculations but:
  - EE is implemented with complementary programs, which should have their own EM&V plans
  - California's and RGGI's approaches can be examples

EM&V Requirements

Emissions Guidelines (EG) requirements are general and relatively limited, including (see EG for complete description):

- State plan would include EM&V plan for quantifying and verifying electricity savings on a retrospective (ex-post) basis using industry best-practice EM&V protocols and methods that yield accurate and reliable measurements of electricity savings.
- Assessment of the independent factors that influence the electricity savings and the expected life of the savings
- Baseline that represents what would have happened in the absence of the demand-side EE activity
- Periodic M&V reports
- Independent verification
- Skill certification is also discussed

EM&V Guidance and Model Trading Rule

Cover wide range of EM&V topics, including the following list from CPP EM&V Guidance document:

- EM&V Methods
- Electricity savings metrics and baselines
- Reporting timeframes and considerations
- Deemed savings
- Independent factors
- Accuracy and reliability
- Avoiding double counting
- Persistence of savings
- Savings quantification/verification cycles
- T&D savings adders
- Interactive effects
- EE EM&V Protocols and Guidelines

Also Covered in Guidance and/or Model Rule:

- Tracking and compliance systems
- Independent verification and review
- Additional EM&V guidance for several common EE program and project types
  - Programs implemented using utility customer funds ("utility EE programs")
  - Individual or aggregated EE projects, such as those implemented by ESCOs or at industrial facilities
  - Building energy codes
  - Appliance energy standards
- Glossary of key terms
- Templates for program and project EM&V plans.
- Examples for several common measure types

Trading– Quick Notes

- Trading is allowed, encouraged in the Rule:
  - Emission rate credits (for a rate-based standard) or
  - Allowances (for a mass-based standard)
- Trading of ERCs, including EE ERCs under Rate Based Approach, can support CPP compliance:
  - Intra-state and Inter-state
  - Final Plan does not require complex air quality modeling to identify location of emission impacts from efficiency nor adjustment or discounting of efficiency impacts that cross state lines
  - Systematic tracking and accounting procedures are required such as those already being used by many states and EE providers
- In terms of mass plans:
  - There is not a currently defined mechanism for trading efficiency-based allowances in the CPP documents
  - One case in which efficiency could receive allowances under a mass-based plan approach is through a *set aside* for efficiency program and projects

Thank you

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Additional Background Slides

Resources

Resources - CPP

- Clean Power Plan website:
  http://www2.epa.gov/carbon-pollution-standards

- Specific Documents:
  - CPP Emission Guidelines: http://www.epa.gov/airquality/cpp/cpp-final-rule.pdf
  - Federal Model Plan: http://www.epa.gov/airquality/cpp/cpp-proposed-federal-plan.pdf
  - EM&V Guideline:
    http://www2.epa.gov/cleanpowerplantoolbox/draft-evaluation-measurement-and-verification-guidance-demand-side-energy

- For additional resources to help states develop plans, visit the CPP Toolbox for States: http://www2.epa.gov/cleanpowerplantoolbox

- EPA Overview and energy efficiency presentations:
  http://www2.epa.gov/cleanpowerplan/clean-power-plan-overview-webinar
  http://www2.epa.gov/cleanpowerplan/fact-sheet-energy-efficiency-clean-power-plan

Efficiency Resources

- ACEEE – American Council for Energy Efficiency Economy – non-profit efficiency organization www.aceee.org
- Utility and other program administrator websites (e.g. Northwest Energy Efficiency Alliance – www.neaa.org)
- U.S. DOE Energy Efficiency Office - http://energy.gov/eere/efficiency
- EPA/DOE State and Local Energy Efficiency Action Network (SEE Action)–
  - focuses on providing assistance states need to advance policies and practices that bring energy efficiency to scale. www.epa.gov/cleanenergy/energy-programs/seeaction/

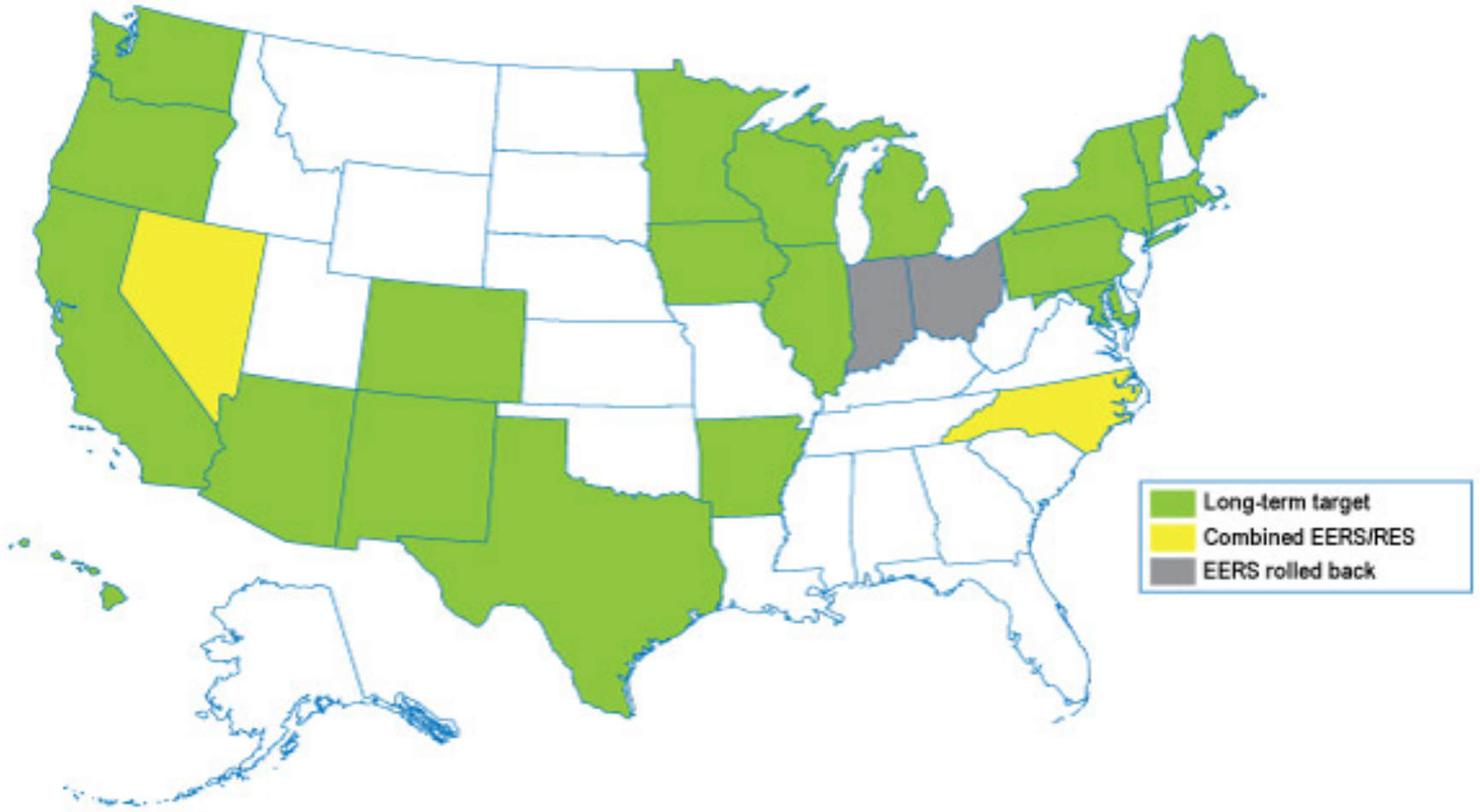
EM&V Resources

- EPA/DOE State and Local Energy Efficiency Action Network (SEE Action)–
  - focuses on providing assistance states need to advance policies and practices that bring energy efficiency to scale. www.epa.gov/cleanenergy/energy-programs/seeaction/index.html
- The Northwest Regional Technical Forum –
  - an advisory committee established to develop standards to verify and evaluate conservation savings. http://www.nwcouncil.org/rtf/about.htm
- Regional EM&V Forum (Northeast and Mid-Atlantic) –
  - supports the development and use of common and/or consistent protocols to evaluate, measure, verify, and report the savings, costs, and emission impacts of energy efficiency. Covers 11 states. http://www.neep.org/emv-forum
- EVO –
  - capacity building for M&V best practices www.evo-world.org

Efficiency Status Across the Country

The following slides provide a sense of the growth of efficiency activity in the U.S. and efficiency potential

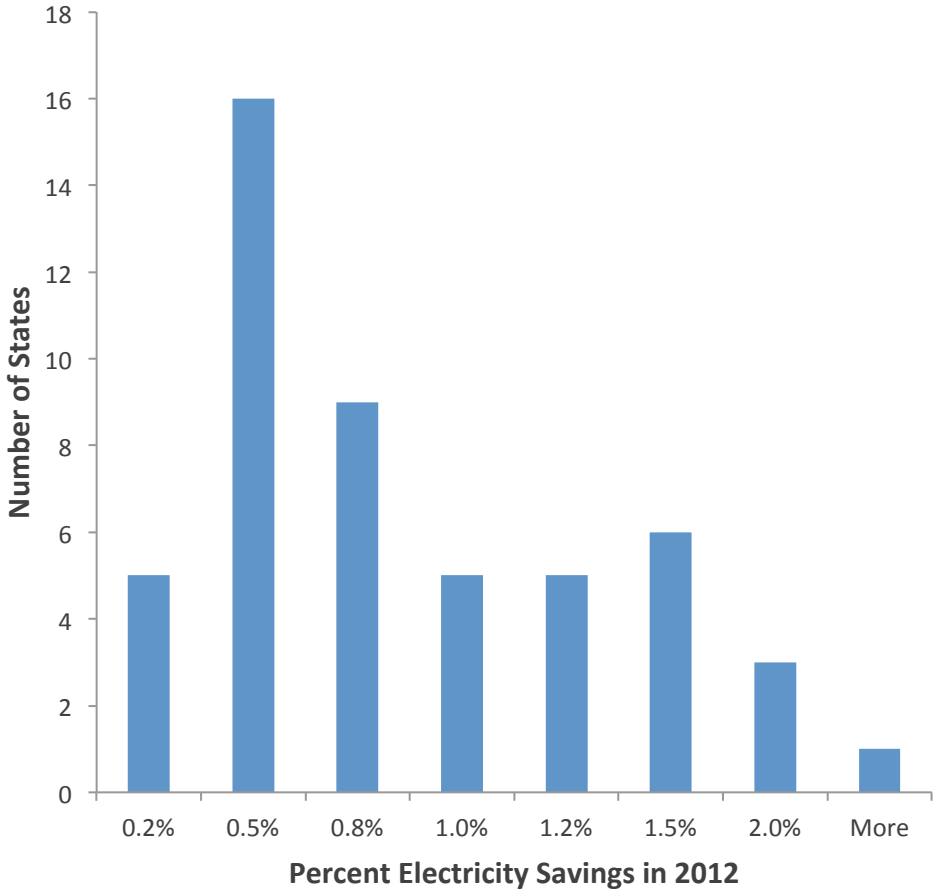
Half of States Have Energy Savings Targets



Source: ACEEE, www.aceee.org accessed 9/11/15

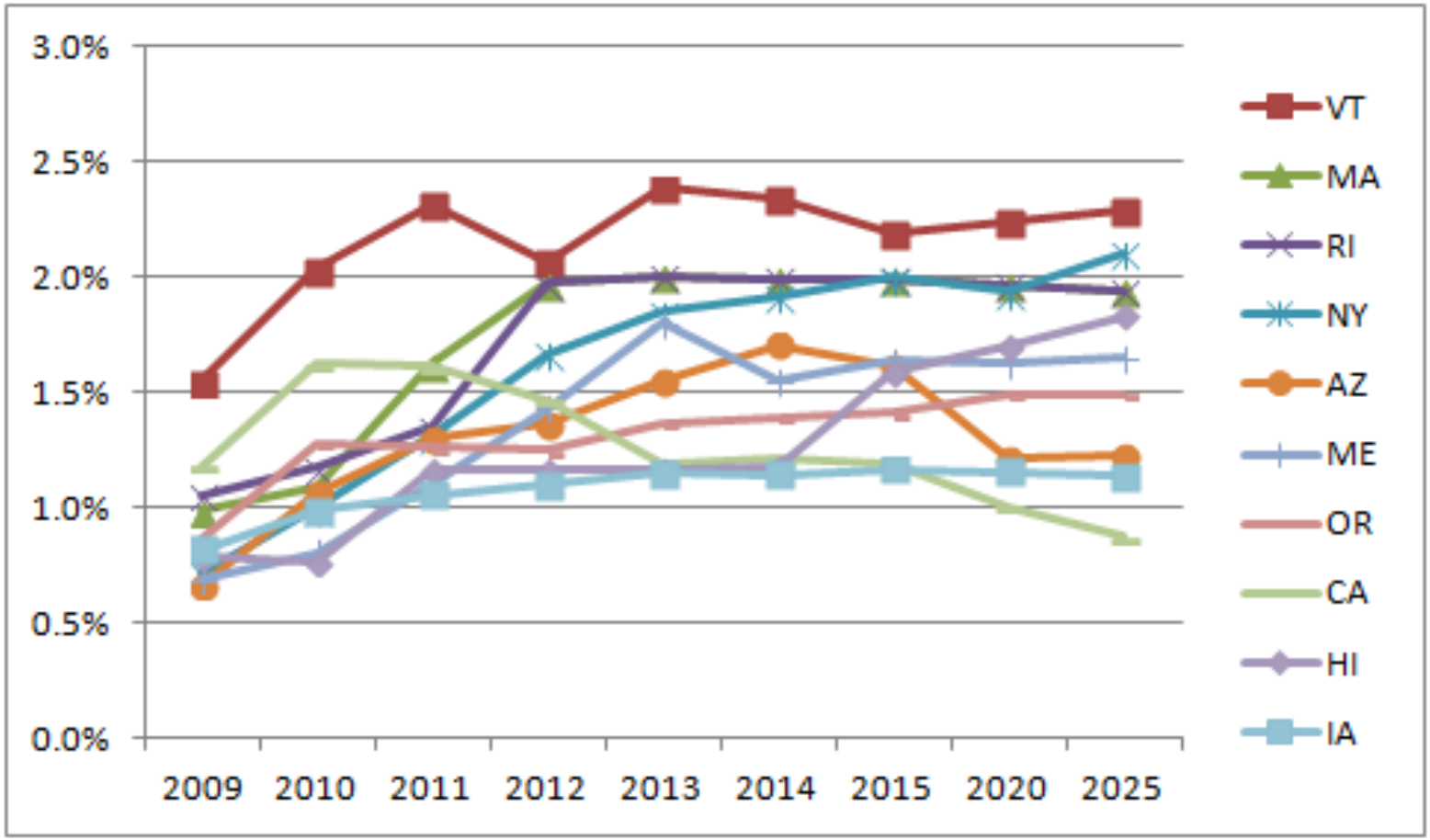
Estimated Achieved Annual Electricity Savings Rising Among States

- 30% of states achieving 1% or higher annual incremental electricity savings
- Many "new" states – about 40% – are saving 0.2% to 0.7%
  - Given the prevalence of rising targets, most of these states are poised for higher savings



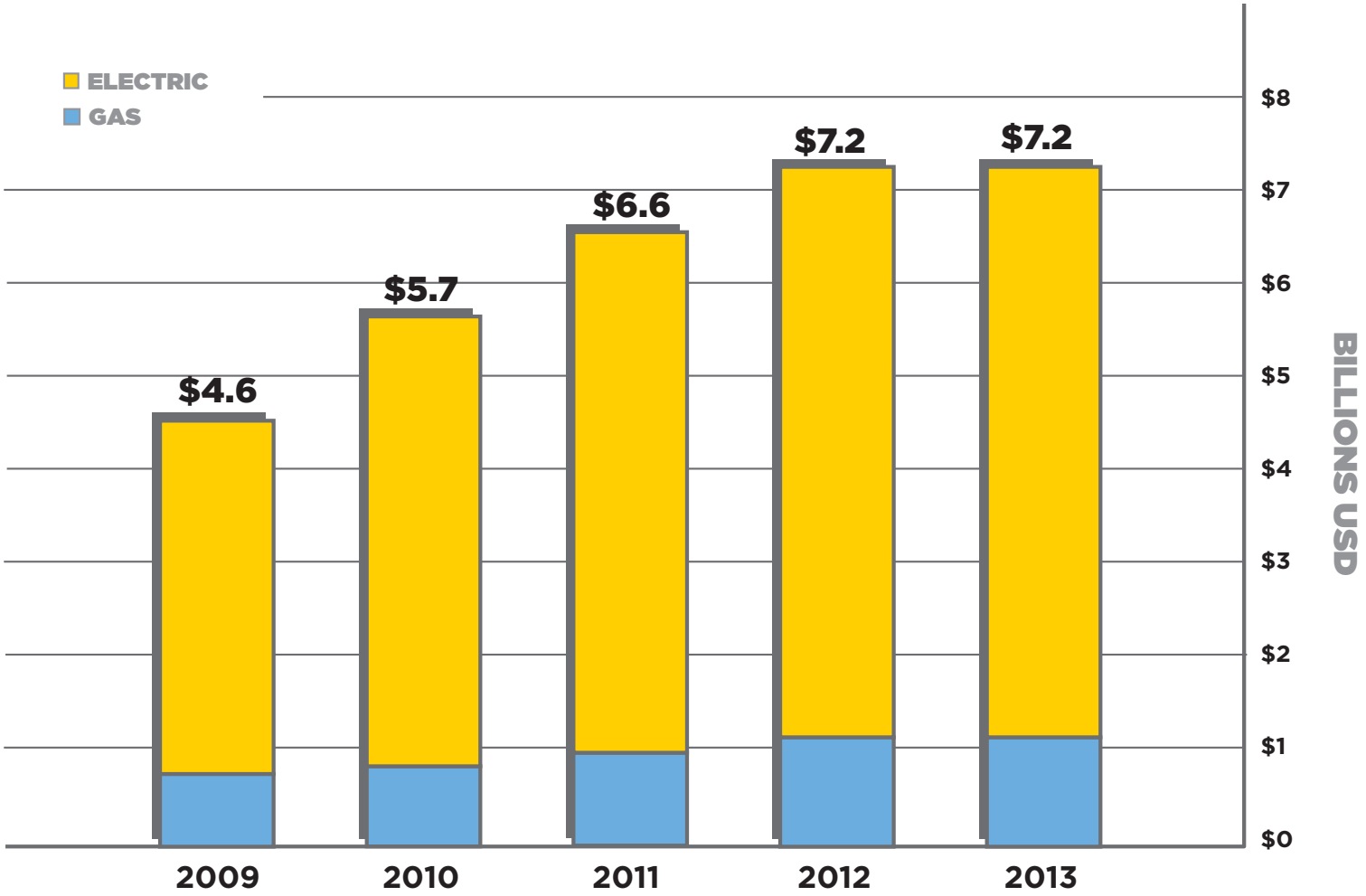
Source: Barbose et al. "The Future of Utility Customer-Funded Energy Efficiency Programs in the United States: Projected Spending and Savings to 2025" LBNL-5803E. 2013

Most Leading States Projected to Save 1.5% or More



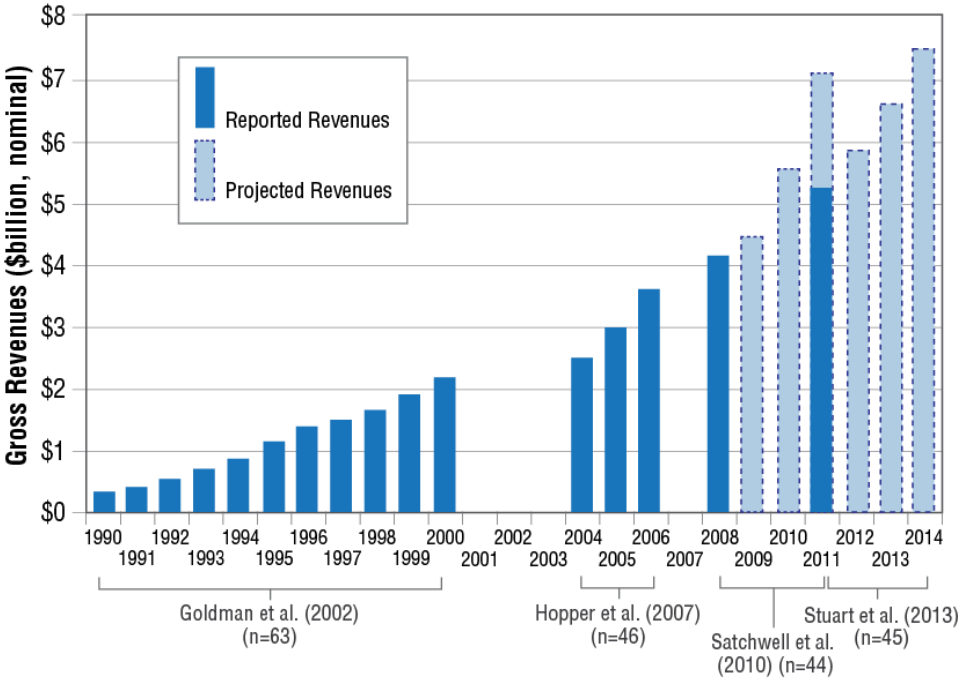
Source: Barbose et al. "The Future of Utility Customer-Funded Energy Efficiency Programs in the United States: Projected Spending and Savings to 2025" LBNL-5803E. 2013

Growth in Total Electric (and natural gas) Demand Side Management Spending



2014 State of the Efficiency Program Industry: Budgets, Expenditures, and Impacts, Consortium for Energy Efficiency, 201

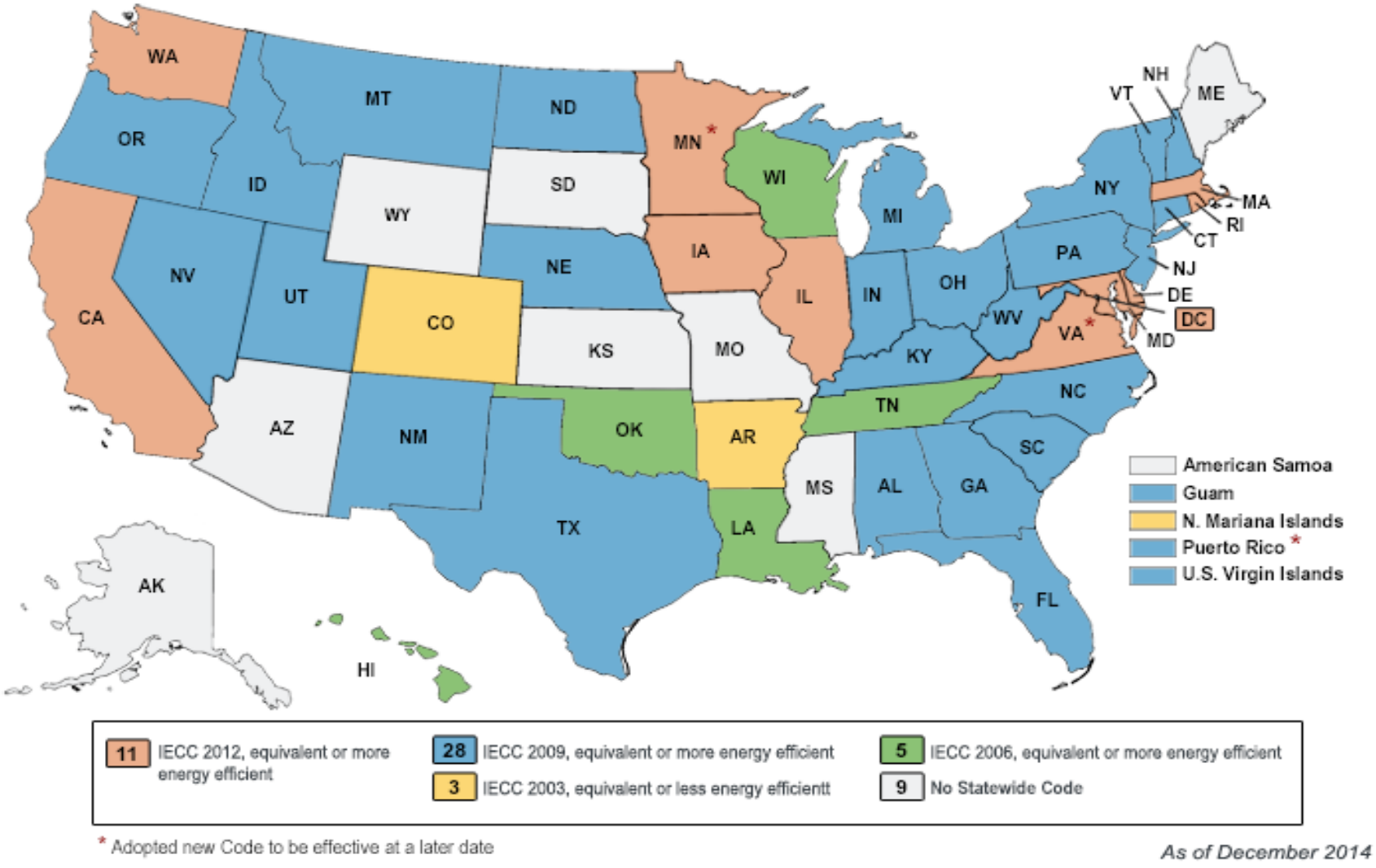
ESCO Industry Growth



- **The industry reported revenues of about $5.3 billion in 2011, with estimated 2013 revenues of about $6.4 billion. Still, the remaining investment potential in public and institutional facilities is large, estimated at about $71 billion to $133 billion**
  LBNL, Stuart et.al 2013

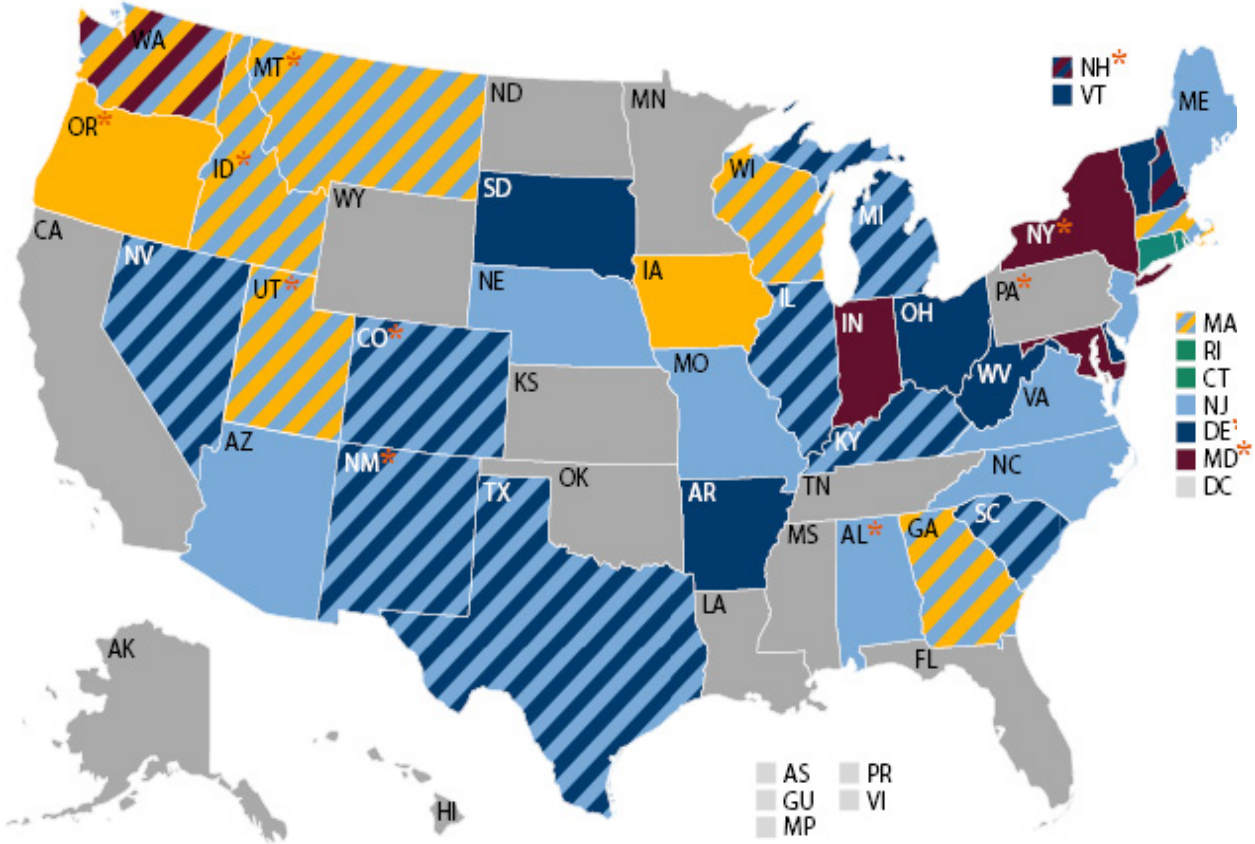
- **LBNL projects that the ESCO industry will grow from ~$4 billion (2008) to $7.5 billion (2014).**

More Than Two-Thirds of States Have Adopted 2009 or Later Residential Codes



Source: DOE Building Energy Codes Program, December 2014, http://www.energycodes.gov/status-state-energy-code-adoption

Nearly 75% of States Are Engaged in Some Form of Compliance Enhancement



BCAP Compliance Planning Assistance
In completing the Compliance Planning Assistance (CPA) Program, BCAP will identify the gaps in code implementation in 15 states, and help complete a roadmap of reachable goals to improve compliance.

DOE Code Adoption, Training, Compliance
States that have received a funding contract from the U.S. Department of Energy to support activities to adopt and implement the U.S. model energy codes.

State Projects
These states have organized their own programs to improve compliance with the 2009 IECC, and will be tracking compliance with the code on their own.

DOE Compliance Pilot Studies
The U.S. Department of Energy has begun tracking compliance with the 2009 IECC in select states that have already adopted the code, and will publish usable best practices for compliance for any state.

Regional Energy Efficiency Group Projects
These states are taking part in compliance programs and studies organized by their respective regional group: NEEP, SEEA, MEEA, NEEA, and SWEEP.

*** Recent Model Code Training**
States that have recently provided training on new codes equivalent to or more stringent than the 2009 IECC or ASHRAE Standard 90.1-2007.

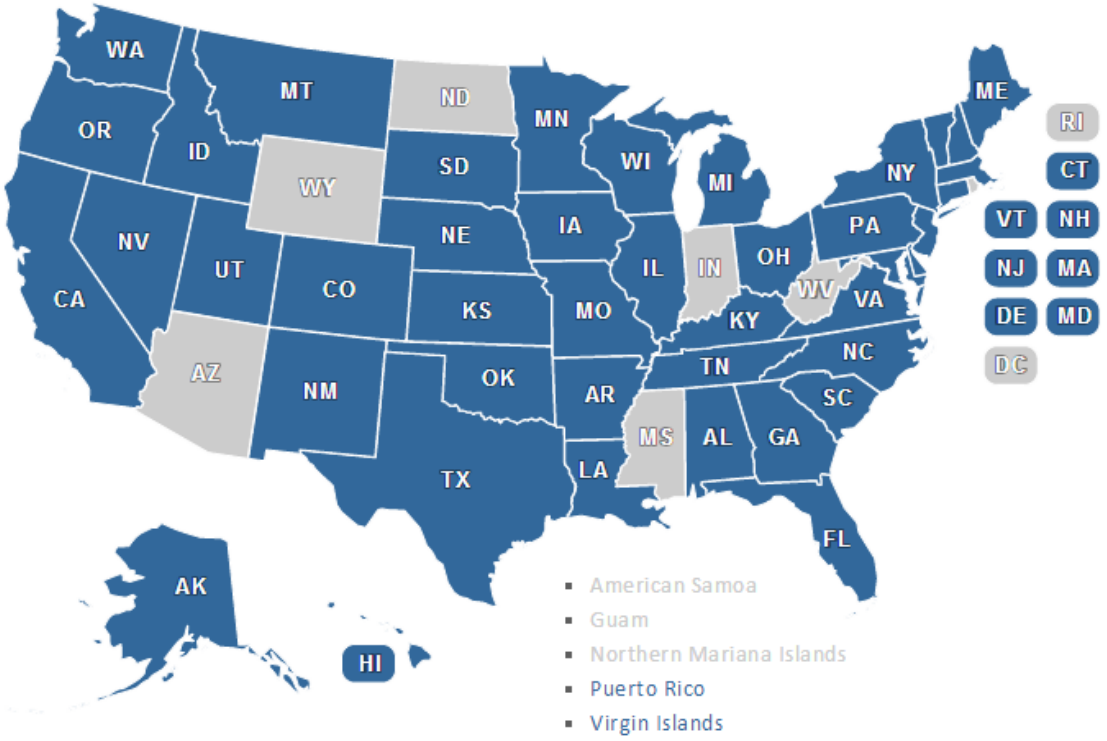
Source: BCAP

Revolving Loan Funds and Loan Loss Reserves Prevalent in Most States

NASEO SELF database

NASEO has tracked a total of 79 programs in 44 states, representing a total of over $2 billion in available state financing for energy efficiency and renewable energy projects in a variety of sectors.

LBNL's forthcoming paper on ARRA-funded RLFs and LLRs, a collaboration with NASEO, will add to understanding of RLF and LLR programs.



Source: NASEO SELF database

High level sense of efficiency's potential

It depends, but

- **Codes and Standards**
  - Savings from Codes and Standards have each grown from essentially zero to about 1% of national electricity sales in 2012 and growing
- **Utility efficiency programs**
  - Grown from very small impacts in the 1980s to about 0.5% annual decreases in electricity consumption nationally
  - Based on current state policies, savings from these programs could reach 0.8% to 1.1% per year of national electricity sales by 2025
- **Using broad generalization – efficiency can probably save, cost-effectively, at least 1% to 2% (some say 3%) of electricity sales each year**
- **For comparison,** EIA's 2012 reference case projects that U.S. electric retail sales will grow by 0.58% annually through 2025 (net of some assumed efficiency)

Some Clean Power Plan Basics

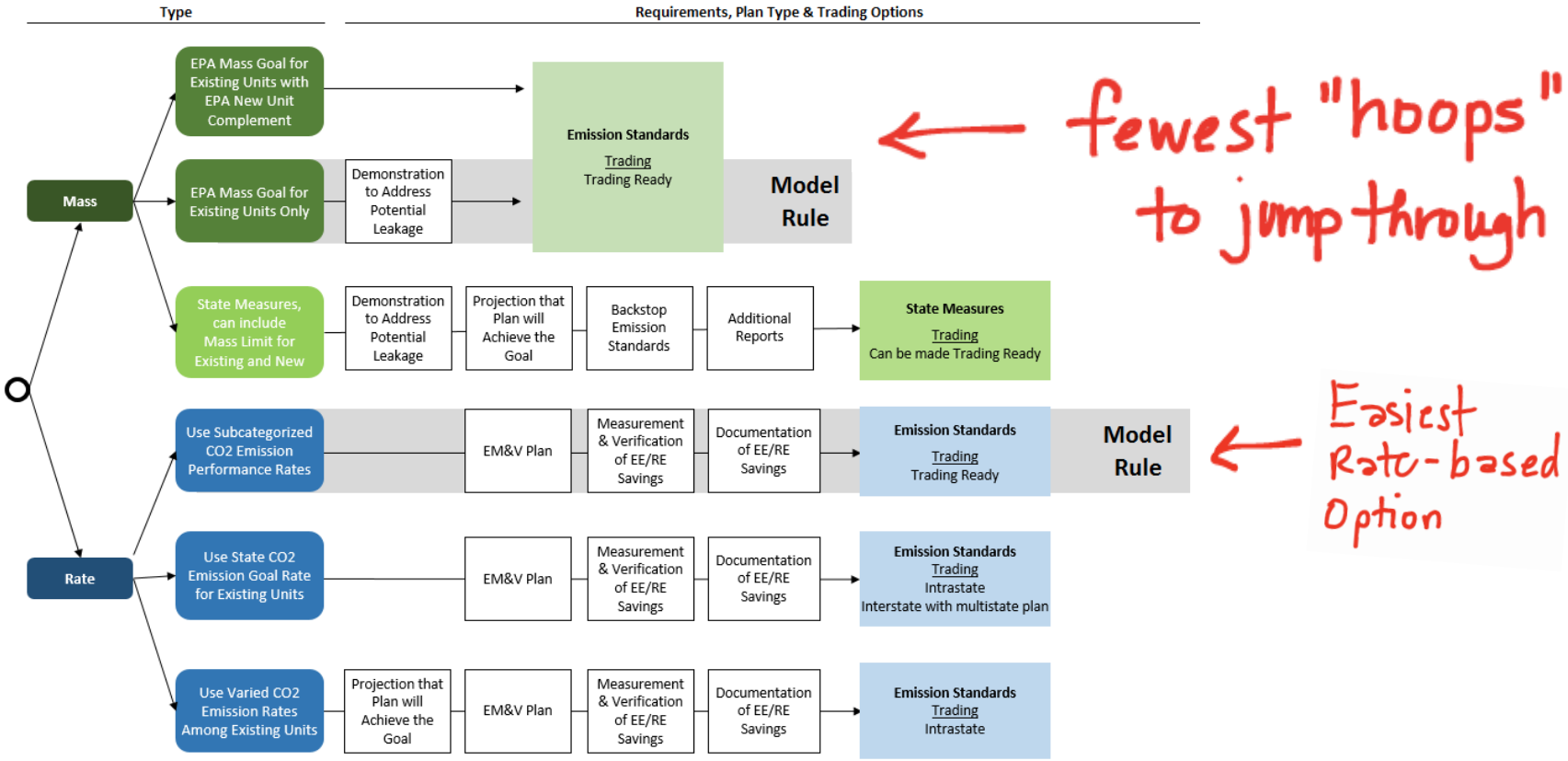
A brief aside on "Mass" versus "Rate"

The following slides are form Franz Litz
of the Great Plains Institute

OVERVIEW

- Two trading ready models < Rate / Mass
- EPA will use one for a federal plan, if called for
- EPA's cost analysis found mass 39% less costly + mass is easier + more predictable

EPA's MAPPING OF THE STATE PLAN APPROACH OPTIONS



← fewest "hoops" to jump through

← Easiest Rate-based Option

Message: Mass is easiest, with less EPA involvement/fewer approvals

Slide form U.S. EPA – comments from Franz Litz – Great Plains Institute

How Mass-Based Trading Works

Emissions Budget

State's Mass-Based Goal →

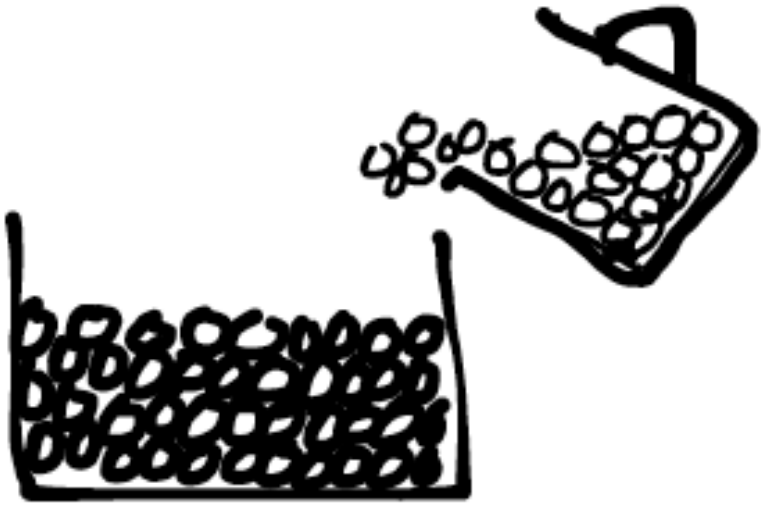
= allowed tons, or "allowances"

Emissions budget = total number of tons that can be emitted

State must distribute allowances

(under federal plan EPA makes this decision)

If a State Covers New Plants



Add

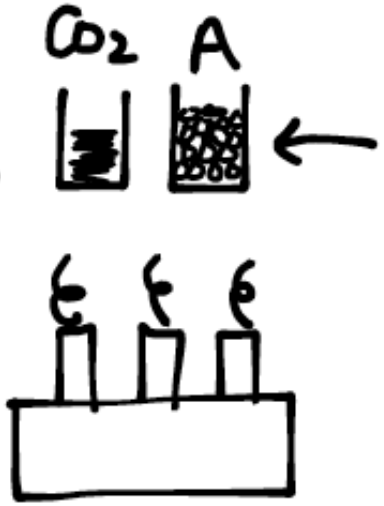
New Source "Complement" if covering new plants

allowances

(EPA won't cover new plants)

WHAT POWER PLANTS MUST DO

Every plant must measure, monitor + report its CO_2 emissions



Every plant must have sufficient allowances to cover its emissions at the end of each compliance period

(same whether EPA or State implements)

Rate = emissions/ production – lbs of CO_2/MWH

How Rate-Based Trading Works

ERCs = Emission Rate Credits – units are MWh – add to production to reduce rate

- Every plant measures, monitors + reports CO_2 emissions + generation (MWhrs)
- Every plant must meet prescribed emissions rate, either actually or after ERCs are added to generation.

Other ERCs

STATE PLANS

- Demand-side EE in a rate-based state generating savings in 2022 or later
- Savings from Transmission + Distribution upgrades post-2012 delivering savings in a rate-based state in 2022 or later.
- CHP/WHP
- Biomass/ Waste to Energy
- Any other measure that meets general requirements

These may or may not end up in federal plan

How to Decide Rate or Mass?

Total Cost?

ON DAY ONE

Allowances | ERCs

Will they be there when I need them?

Administrative Simplicity

Transaction costs?

Budget? Staffing?

What are the options to comply?

What can free up allowances?		What can Earn ERCs?
YES	Retirements?	NO
YES	Shift to Gas?	(LIMITED)
YES	New Renewables?	YES
YES	Energy Efficiency?	YES
YES	New Nuclear?	YES
YES	Decreases in Electricity Demand (other than EE)?	NO

But this is the big "rub" of mass plans – increases in electricity demand use allowances